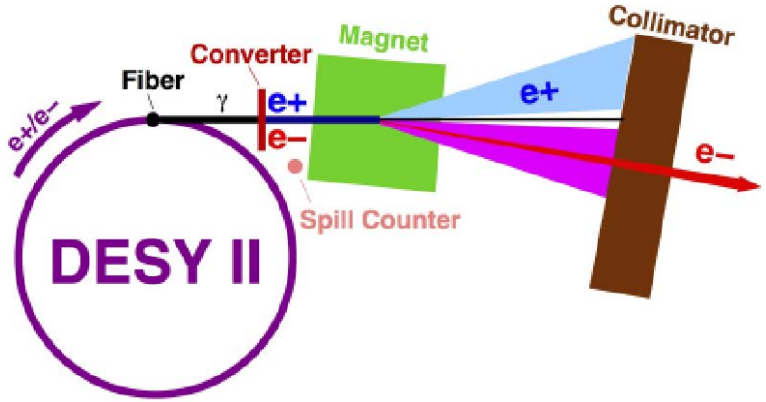
Safety First !

Safety Briefing for DESY Test Beam Users

For more detailed information read the general DESY safety instruction.
English: http://d5.desy.de/e61251/index_eng.html
German: http://d5.desy.de/e61251/index_ger.html



Ralf Diener
Norbert Meyners
Marcel Stanitzki
DESY Test Beam Coordinators

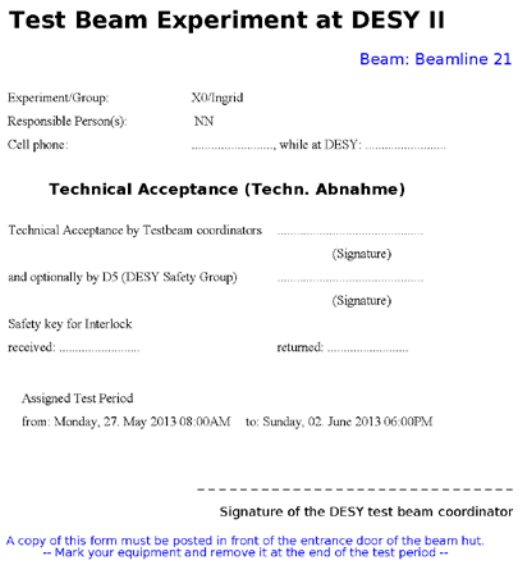
Status: 2015-Sep-17

HELMHOLTZ ASSOCIATION

DESY

Responsibilities

- **Each user group has to assign one person as the responsible person**
  - This responsible person is the **boss** and is responsible for all actions of the user group.
  - If there is more than one group is working in an area, a **coordinator** has to be assigned.
  - The test beam safety rules are especially for this area and might be more strict than for other areas.
- **All responsibilities are collected on the door sheet that has to be filled and placed next to door of the hut!**



Test Beam Experiment at DESY II

Beam: Beamline 21

Experiment/Group: X0/Ingrid
Responsible Person(s): NN
Cell phone: ....., while at DESY: .....

Technical Acceptance (Techn. Abnahme)

Technical Acceptance by Testbeam coordinators .....
(Signature)
and optionally by D5 (DESY Safety Group) .....
(Signature)
Safety key for Interlock
received: ..... returned: .....

Assigned Test Period
from: Monday, 27. May 2013 08:00AM to: Sunday, 02. June 2013 06:00PM

Signature of the DESY test beam coordinator

A copy of this form must be posted in front of the entrance door of the beam hut.
-- Mark your equipment and remove it at the end of the test period --

General Safety Rules for DESY TB

- Obey the **safety signs**!
  - **NO** people with **pacemakers** in the hall!
  - Do NOT touch or enter areas which are signed as **electrical area** (current leads, dump switches, etc.).
  - In case of problems inform the experts and the safety officer.
- No open fires in the hall
- No smoking**,** eating or drinking in the test beam hall!
  - Food and drinks (non-alcoholic) allowed in the control huts
- Watch out for crane work.
  - Stay clear of hanging loads and wear hard heads if you assist.
- **Working alone:**
  - Is only permitted for data taking during normal working hours (8-17h, Mo-Fr).
  - Outside normal working hours: a minimum team of two people required
  - Working inside the beam areas: never alone.
- People **under 18 years** old are not allowed to work without personal supervision.

Important Phone Numbers

Emergency (Notruf) 2500

Technical Emergency Service (Technischer Notdienst)	5555
Accelerator Control Room (BKR)	3500
Test Beam Coordinators	
Ralf Diener	(9)-3426
Norbert Meyners	(9)-3321
Marcel Stanitzki	(9)-4930
Useful Numbers	
Telescope Support	+49 151 72713427
Porter's Lodge Notkestrasse	3333

> If you hear anomalous noise (whizzing or whistling) or if you notice other **strange things** (water floods, fountains) inform the DESY Technical Emergency Service

Phone: 5555

- Take into account to leave the hall before.

Most Important Number !

> In case of an emergency

- Do not call an external emergency number!
- DESY SAFE will make sure that help can find you in the hall as fast as possible.
- Remember your First Aid Training.
  (The next first aid supplies are available in the white locker in south west corner of the hall close to the huge south gate.
  A stretcher is available at the North West corner).

DESY Emergency phone

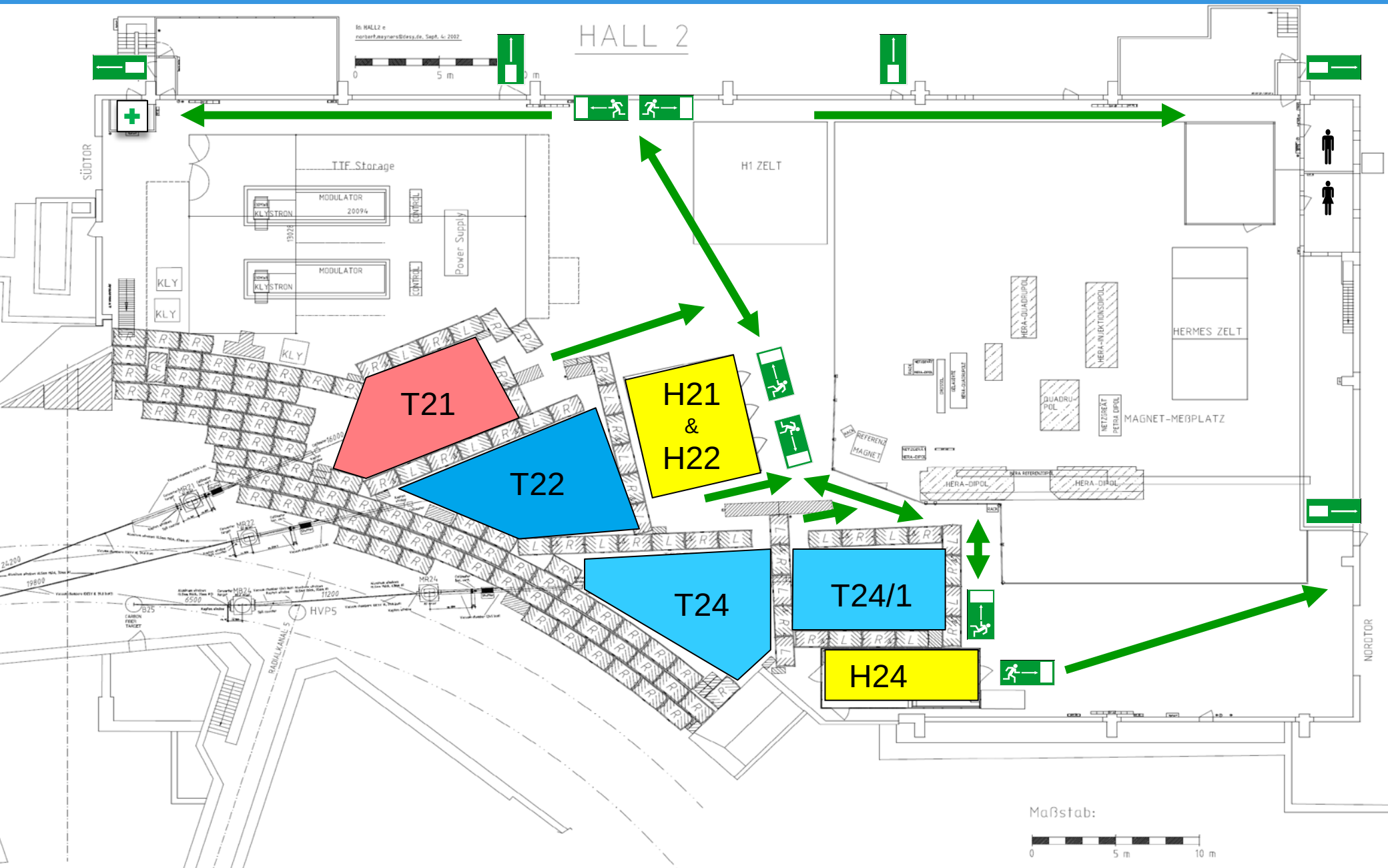
2500

DESY Mobile	**66 – 2500**
External Mobile	**+49 -40- 8998-2500**

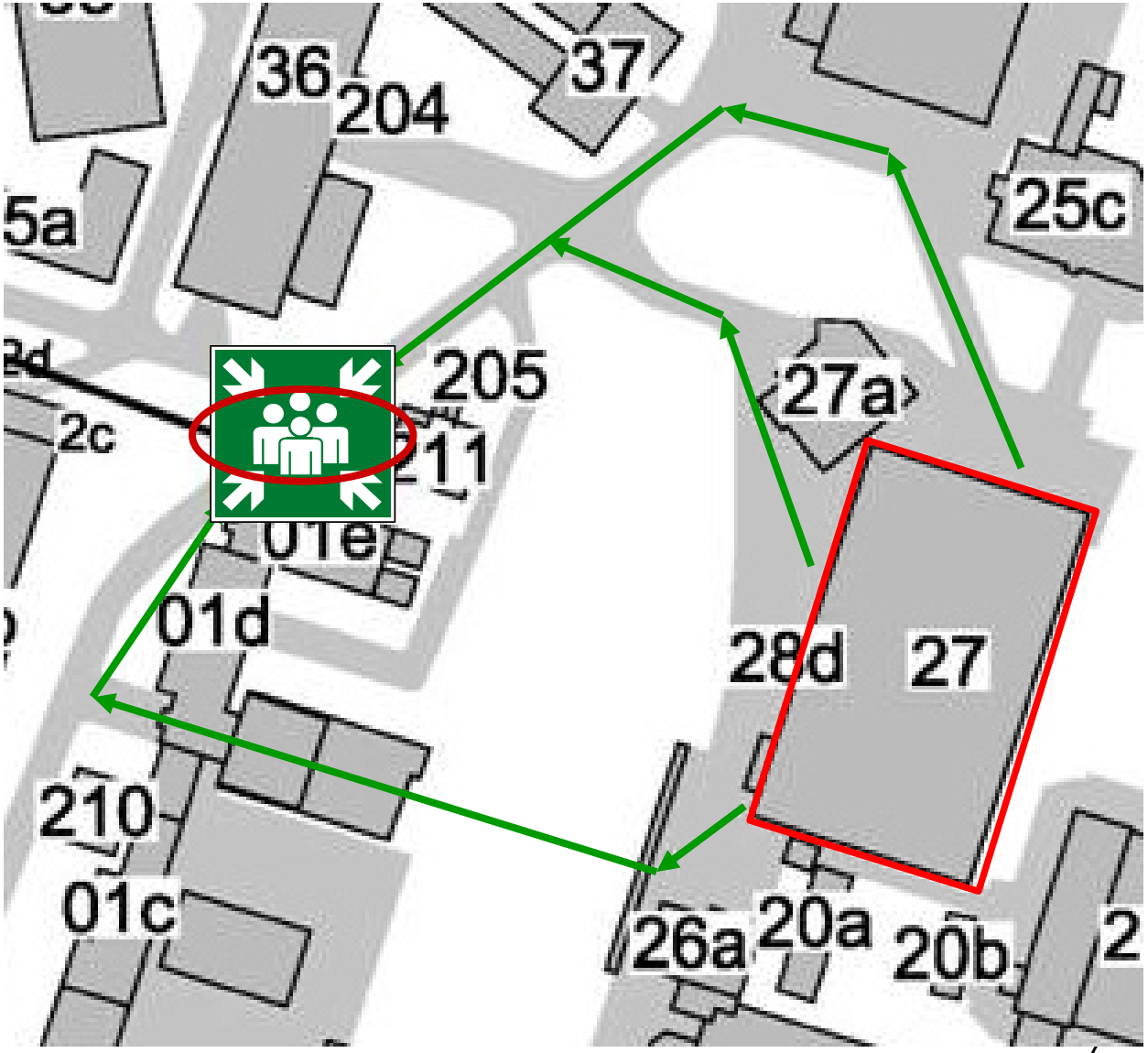
Please inform the test beam coordinators about any safety relevant incident that occurred.

Who ?	Who is calling the emergency
Where ?	Give the building (Building, which beam area...)
What ?	Description of the problem
How many ?	Number of people of affected
What ?	Kind of injury and if there is danger of life !
Wait !	Wait for questions !

Building 27 Escape Routes

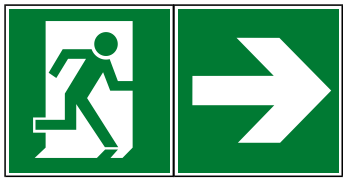


Assembly Point Test Beam Hall (Building 27)



Large Fire

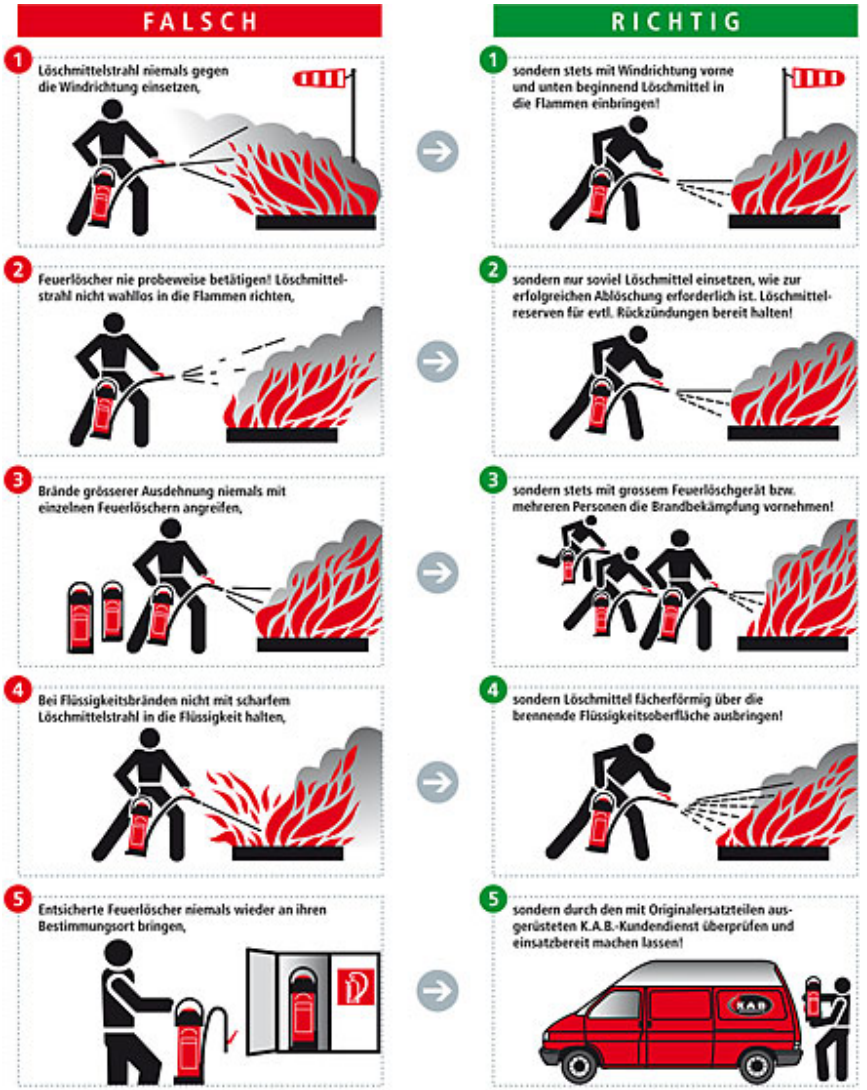
- Leave the hall as fast as possible
- Make sure your colleagues are leaving with you (and help them if necessary)
- Call: **2500**
- Use escape routes
- Go to the assembly point
- Inform the fire brigade if people are missing.



Small Fire

Only if you think this is feasible!

- Small fires elsewhere in the hall may be attacked by you with a fire extinguisher
- Press emergency off
- Keep a distance of 1 m minimum from electrical and HV systems
- For HV systems use CO_2 fire extinguisher
- Inform test beam coordinators and Technischen Notdienst (Tel.:5555)


FALSCH
RICHTIG
1 Löschmittelstrahl niemals gegen die Windrichtung einsetzen,
1 sondern stets mit Windrichtung vorne und unten beginnend Löschmittel in die Flammen einbringen!
2 Feuerlöscher nie probeweise betätigen! Löschmittelstrahl nicht wahllos in die Flammen richten,
2 sondern nur soviel Löschmittel einsetzen, wie zur erfolgreichen Ablöschung erforderlich ist. Löschmittelreserven für evtl. Rückzündungen bereit halten!
3 Brände grösserer Ausdehnung niemals mit einzelnen Feuerlöschern angreifen,
3 sondern stets mit grossem Feuerlöschgerät bzw. mehreren Personen die Brandbekämpfung vornehmen!
4 Bei Flüssigkeitsbränden nicht mit scharfem Löschmittelstrahl in die Flüssigkeit halten,
4 sondern Löschmittel fächerförmig über die brennende Flüssigkeitsoberfläche ausbringen!
5 Entsicherte Feuerlöscher niemals wieder an ihren Bestimmungsort bringen,
5 sondern durch den mit Originalersatzteilen ausgerüsteten K.A.B.-Kundendienst überprüfen und einsatzbereit machen lassen!

Emergency off and Before data taking

> Emergency off:

- Emergency off buttons at the **hut (3)**
  and at the **entrance** of the area
  (21 and 22 together *and* 24 and 24/1 together)
  and **inside** 24/1 (24/1: beam stop = power stop)

➔ Take power **only** from the **outlet boxes** or the **hut**
and not from somewhere else

> Before Data taking:

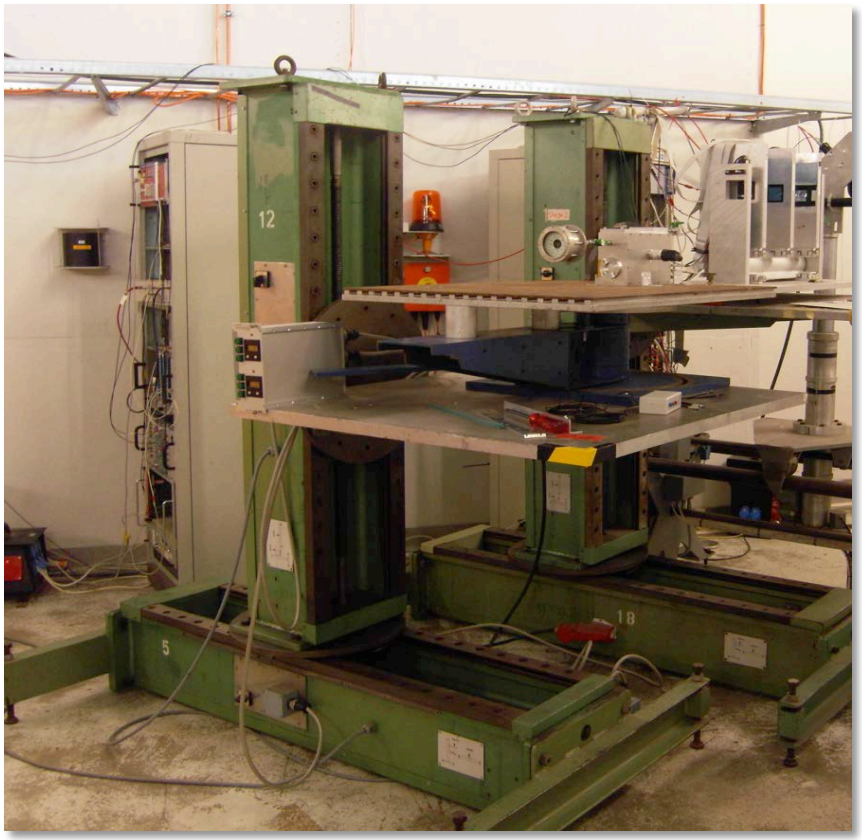
- Safety check by one of the test beam coordinators

Completely new setups or special hazards:

- Additional Safety check by the Safety Department (D5)

Translation Stages

- Be careful! Danger of squeezing
  (The big green stages can carry up to 1t)
  - Stay in contact via **phone** during remote operation if people are inside the area!
  - Make sure that the stages do not touch other equipment when they move remotely!
    (Stages with adjustable end switches are available.)
  - Make sure that you don't rip of your own cables.



Unattended Data Taking

- Possible solution to take the best out of the beam time also with small team
- Running automatically without people in the test beam hall
- In principle allowed ….

- Some requirements for running in auto pilot mode:
  - Call the BKR (3500) and tell them from when to when you will have the control room unattended and give them a contact phone number
  - Prepare a note with the same information and put this over the shutter button
  - On return inform the BKR that the room is attended again.
- Unattended data taking is NOT ALLOWED when hazardous material is in use (i.e. flammable gas or radioactive material)

Lead and Ladders …

> Lead / Iron bricks:

- Iron and Lead bricks are heavy.
- Lead is poisonous. (Avoid hand-mouth contact)
- Wear gloves when handling lead! (Gloves are provided)

> Ladders

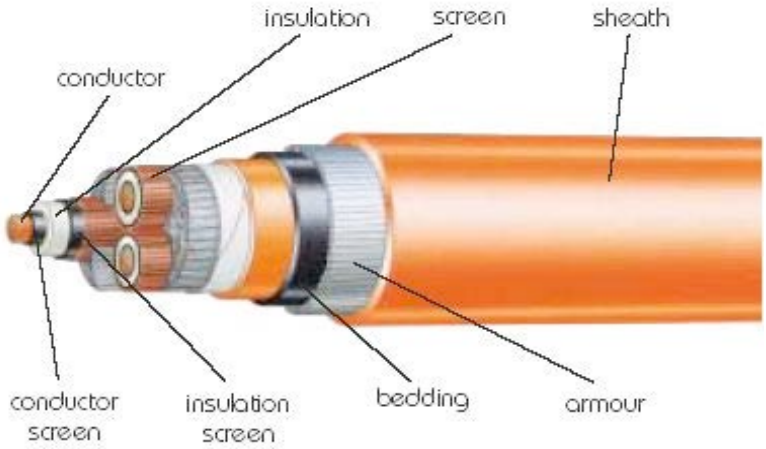
- Working on ladders is quite **dangerous!**
- Do **NOT** take broken ones
- Use properly: Correct angle, solid ground
  Both feet on the ladder
- Best if a second person is holding the ladder
- **You are not allowed to climb on the walls or huts!**
- Please use a ladder, stepstool, elephant foot and **NOT** tables, (swivel) chairs etc.

Electrical and HV Systems, Tools and Equipment

- Only **proper** equipment allowed!
  Annual checks for electrical equipment are required
- Home made devices have to be **proper** too
- No Daisy-chaining of power strips
- Obey the voltage limits of connectors
  - No high voltage on Standard Lemo connectors
- High Voltage: > 60 V (legal definition)

High voltage

- **Warning signs**, if needed
- **NO** work on the HV systems or electrical systems with the voltage switched on



Hazardous Materials

> Have to be announced before data taking

> Have to be handled/marked/stored properly

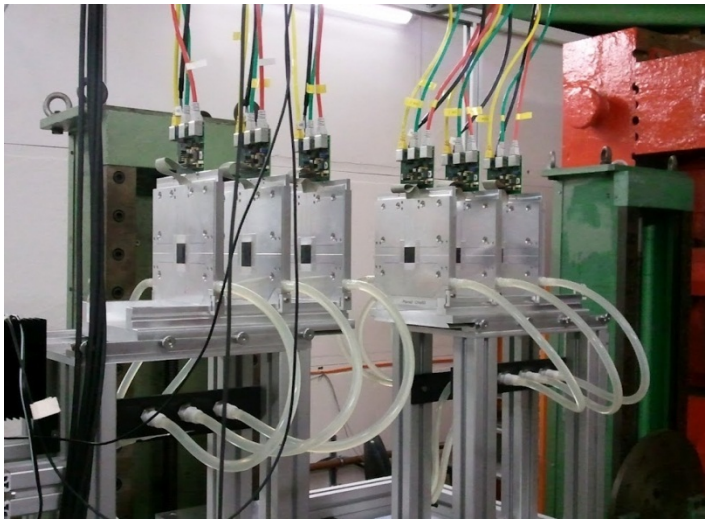
- **All radioactive material that comes to DESY has to be reported to the radiation safety group (D3) !**
- **Shipping will be done by D3**

Gas System

- Be aware of the danger of your gas
- Always attach gas cylinders (bottles)
- Store gas cylinders outside or in gas cabinets
- Use exhaust and ventilation if necessary
- Ask for the adaptation of the gas safety system if needed
- **NO** mechanical work on a running gas system. Check pressure before breaking a gas line
- **NO** manipulation of the gas safety system

The Beam Telescopes

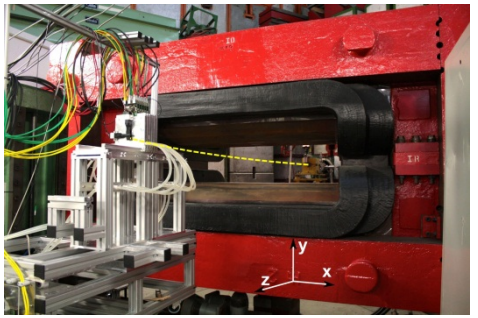
- Several beam areas are equipped with beam telescopes
  - Usage needs to be requested in advance
- There separate instructions for using them
  - Wiki: https://twiki.cern.ch/twiki/bin/view/MimosaTelescope/WebHome
  - User manual (under construction): https://telescopes.desy.de
- If you're having troubles with the telescope
  - Read the telescope e-log: https://tblogs.desy.de
  - Mail to pixel-telescopes@desy.de
  - Call +49 151 72713 427
- The telescopes are complex
  - **Don't move the green telescope xy-stage**
  - **IF IN DOUBT, CALL FIRST**



Test Magnets

- Operation only by trained users (extra session)
- 1 T is a strong field (lifts e.g. a gas bottle easily)
- Field off, when working with magnetic tools!
  - The forces on tools due to the magnetic field can be very high and they can squeeze / hit parts of your body (as well as seriously damage equipment)
- Magnets are connected to the door interlock
- Dipole in T21:
  - Bridging the interlock when magnet on is not possible for users
- PCMAG in T24/1:
  - Access allowed while magnet is on by bridging interlock
  - **For small adjustments only!** (NOT for working on setup)
  - Check very carefully for magnetic tools, jewelry, phones etc.
  - Careful with door interlock:
    it takes up to 12h to cool down again after “emergency”
    ramp down from broken interlock

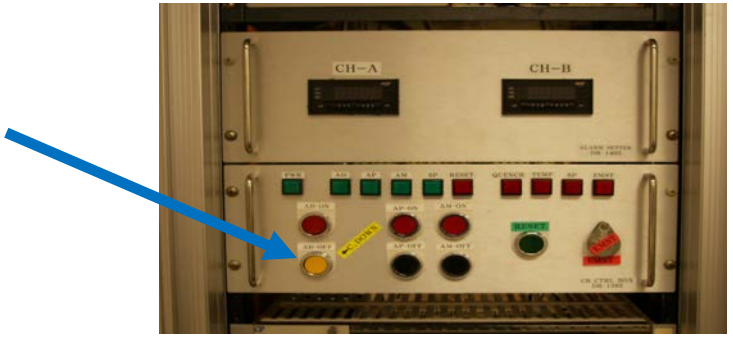
Gas bottle in 1T magnet



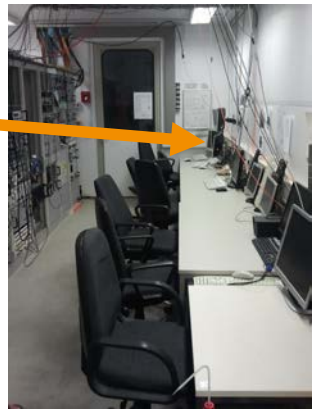
Test Magnet in T24/1

- Movable Magnet Stage (contact: R. Diener, V. Prahl, D. David)
  - Watch **all cables** (also the fixed installation) carefully
  - Do not climb on the lifting stage
  - Do not manipulate the mechanical setup of the stage or the detector holding structure inside the magnet

- Magnet
  - Only operation exception: normal ramp down is allowed for all users by pressing yellow button in magnet rack
  - It is B-field wise safe to enter after 10-15 minutes (check coil current to be sure!)



  - **Always** keep the control area at the back of the hut accessible (no laptops, food, bags etc.)



Laser Alignment System

- Laser Alignment System foreseen in each beam line
- Height: ~1.70 m → ~ eye level for 1.80m person
- Class 1M Laser system
  - As class 1 as long as no optical instruments are used
- Operation restricted by key switch
  - Laser warning sign at area entrance:
    Do not wander in when on
- **Before switching the laser on:**
  - Limit access (close door) and number of people (two)
- **During Use:**
  - Never look directly into the Laser - turn away / close eyes if accidently doing so
    (make sure, that the laser is not shining in the eyes of your collaborators as well)
  - Only use one laser direction (horizontal/vertical) at once whenever possible
  - Never use optical instruments or reflecting tools
  - Only do alignment work while laser is on and switch off before starting other tasks
- **Same rules apply for alignment with the portable cross laser (class 2) !**
- For general DESY Laser Safety rules see here

General Tidiness

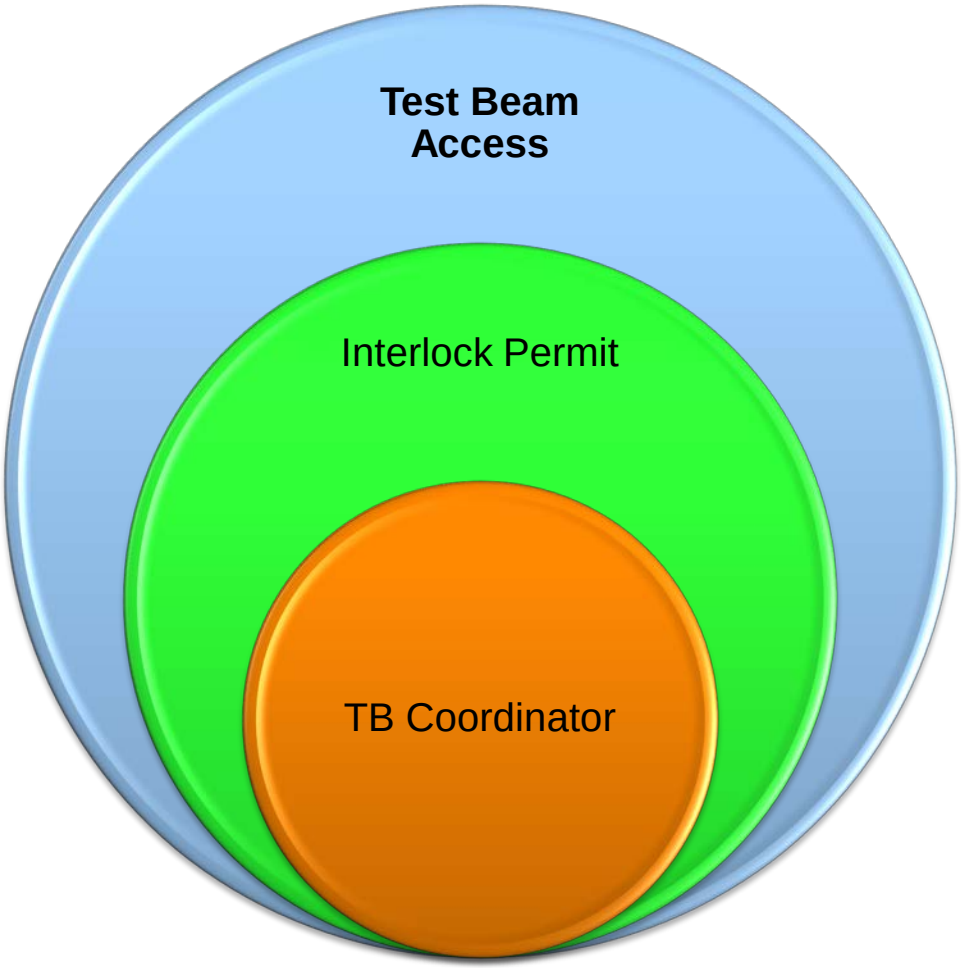
- Please keep the areas tidy and escape routes clear **at all times**
  - No trash or boxes in areas where people walk frequently
- Use larger trash bins in hall or containers outside of the hall for your garbage
  - Small trash bins can also be emptied into large bins outside of the areas …
- Please remove smelly trash from the control huts immediately
  - Cleaning lady does not comes every day
- Clean up before leaving the area
  - The incoming group will appreciate it

DACHS & Access to the Test Beam Huts

- **DACHS**
  - DESY Access Control Handling System
  - Personalized ID
  - Must not be handed to other users
- DACHS card mandatory for the DESY Test Beam
  - Controls access to the huts
  - Required to set the interlock

blue	DACHS ready
green	Access granted
green / red	Hold card longer in front of terminal
red	Access denied

DACHS Access rights



- Three levels of access
- Required for all users
  - DACHS Card
  - TB Safety lecture
- Test Beam Access
  - All users
- Interlock Permit
  - Granted individually by Coordinators
- TB Coordinator
  - Access to Key boxes, etc

Radiation Safety in General

- **Radiation Safety starts with You!**
- **ALARA**: As Low As Reasonably Achievable
  - Always practice **ALARA**
- Key ingredients
  - Proper Shielding
  - Minimize Exposure time
  - Maximize distance ($1/r^2$ is your friend)
- Dose limits from the German Regulations (Strahlenschutzverordung)
- Rad Worker
  - Maximum Annual Dose for a Rad Worker (20 mSv/a)
  - Lifetime Dose of 400 mSv
- Everyone else
  - Less than 1 mSv/a

General Radiation Safety – Signposted Areas

Definition:
Effective Dose > 3 mSv/h
ENTRY FORBIDDEN

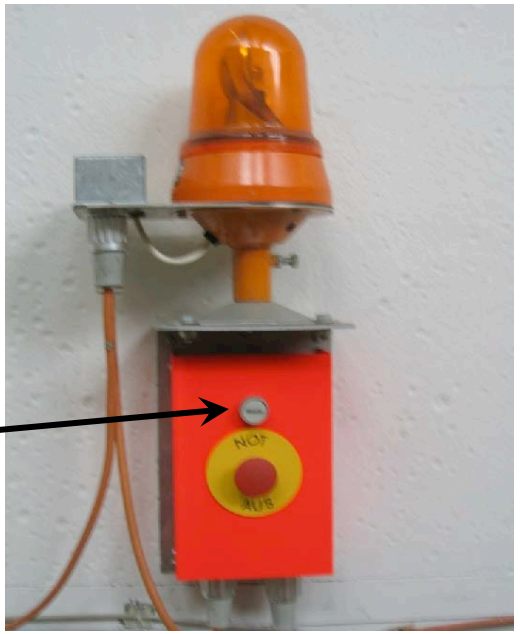
Definition:
Effective Dose > 1 mSv/a
Training & Dosimeter required
No eating, drinking, smoking
Entry for persons under 18 forbidden

Radiation Safety at the DESY Test Beam

- A dosimeter is not required when no beam is present
- Interlock needs to be set before the beam shutter can be opened
  - Area becomes **Prohibited Area/Sperrbereich** if beam is present
- Accessing the area **only by breaking the interlock** (after beam has been switched off and the shutter has been closed)
- Make sure the shutter is closed when you break the interlock by opening the door
- If you work with additional radioactive material (sources or irradiated samples)
  - Dosimeter will be mandatory if dose is > 5 µS/h in 30 cm distance
  - Needs to be clearly marked and properly stored
  - Additional Training is required (see here)
  - Please contact us well in advance

Setting the Interlock

- Take **one** interlock **key per person**
- Key box is secured with DACHS card
  - Hold card in front, press button and turn handle
- “Arm” the interlock system by turning and pressing the key box of the closed area door
  - If door opened without key, process is interrupted
- Do an area search and press the “**Absuche**” button on each interlock boxes inside the area
  - Check everywhere, if area is secure (no people present!)
  - This implies looking under the magnets/stages as well
- Swipe your DACHS card on this terminal
  - Acts as an additional “button”
  - Note: not every test beam user can set the interlock
  - As per federal regulations, the DACHS card who sets the interlock will be logged
- Bridge door interlock with key to leave area

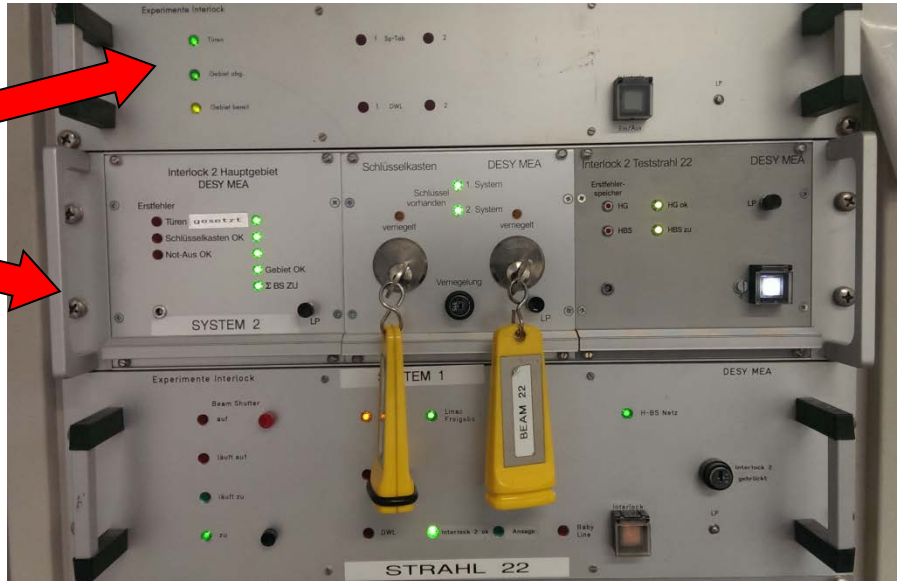


Setting the Interlock (II)

- Before the area search, all but one green light are off

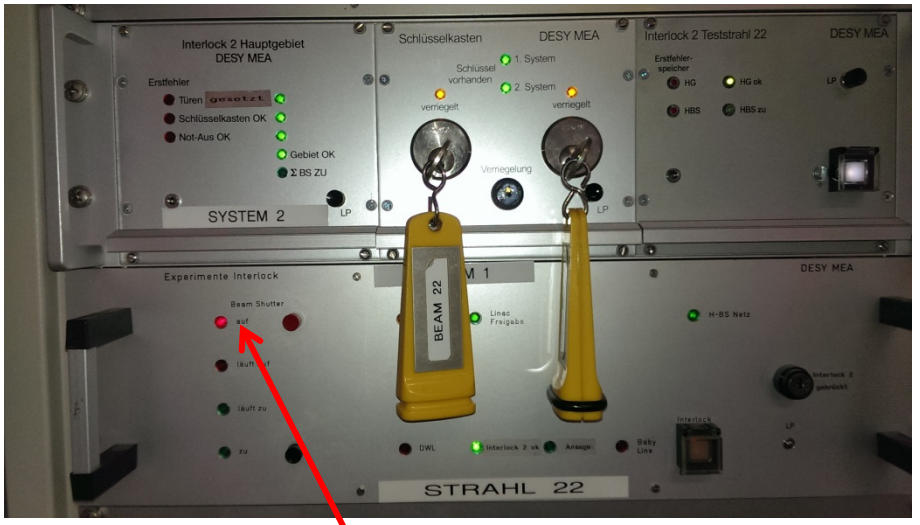
- Area has been searched
  - 3 green lights are on

- Insert both Keys and turn them
  - Area ready (Gebiet Bereit) – Circuit 1
  - All 5 green light are on
  - Shutter can be opened
- When not in use or at the end of the test beam, put the interlock keys back to secured key box



Opening & Closing the Shutter

- Press Red Button **auf** (= “open”)
- Red Light **läuft auf** (= “is opening”) turns on
- Voice will start announcing “Test beam is switched on”
- ~ 60 seconds delay till Shutter actually opens
- Indicated by Red light **auf** being on



- Red Light **auf** (=open) indicates, Shutter is open
- Press **zu** (=“close”)
- Green light **läuft zu**(= “is closing”) turns on
- Shutter closes (a few seconds)
- After Shutter has been closed, Green light **zu** is on

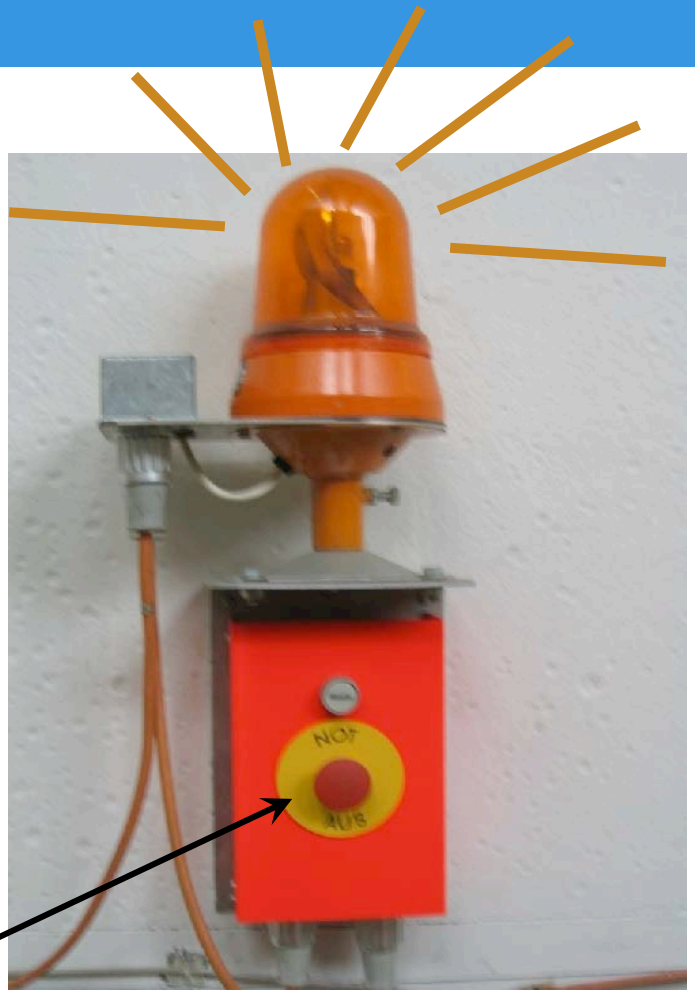
Shutter has opened

- As soon the button “Shutter auf” is pressed a voice will announce that the beam is going to be turned on
- The shutter will only be opened with a 60 seconds delay
- In the unlikely event you are inside the area:
  - You will hear the voice very clearly
  - The yellow alarm lamps flash
- **Stop the beam and leave the area immediately !**
  - **OPEN** the door! ➔ It will break the interlock and stop the beam.

OR

  - **PRESS** “Not Aus” below the flashing light closest to you ➔ It will break the interlock and stop the beam.

Leave the area afterwards.



Controlled Access / ZZ

- As per Directive from D3 and the DESY directorate
- **Controlled Access (ZZ) is no longer permitted at the DESY Test Beam**
- This means
  - Every **access requires breaking** and re-enabling the **interlock**
  - Setting the interlock is 2-3 min operation, no major operational impact

- At the moment, for TB24/1 an exception applies due to the 1 T solenoid magnet being connected to the same interlock

Checking Testbeam Status

At each Test beam door

If on:
Beam is present

If on: Interlock X set

If on:
Door Interlock is set

On the Wall of the Hall

TB 22 Shutter open (EIN)

TB 21, 24 Shutter closed (AUS)

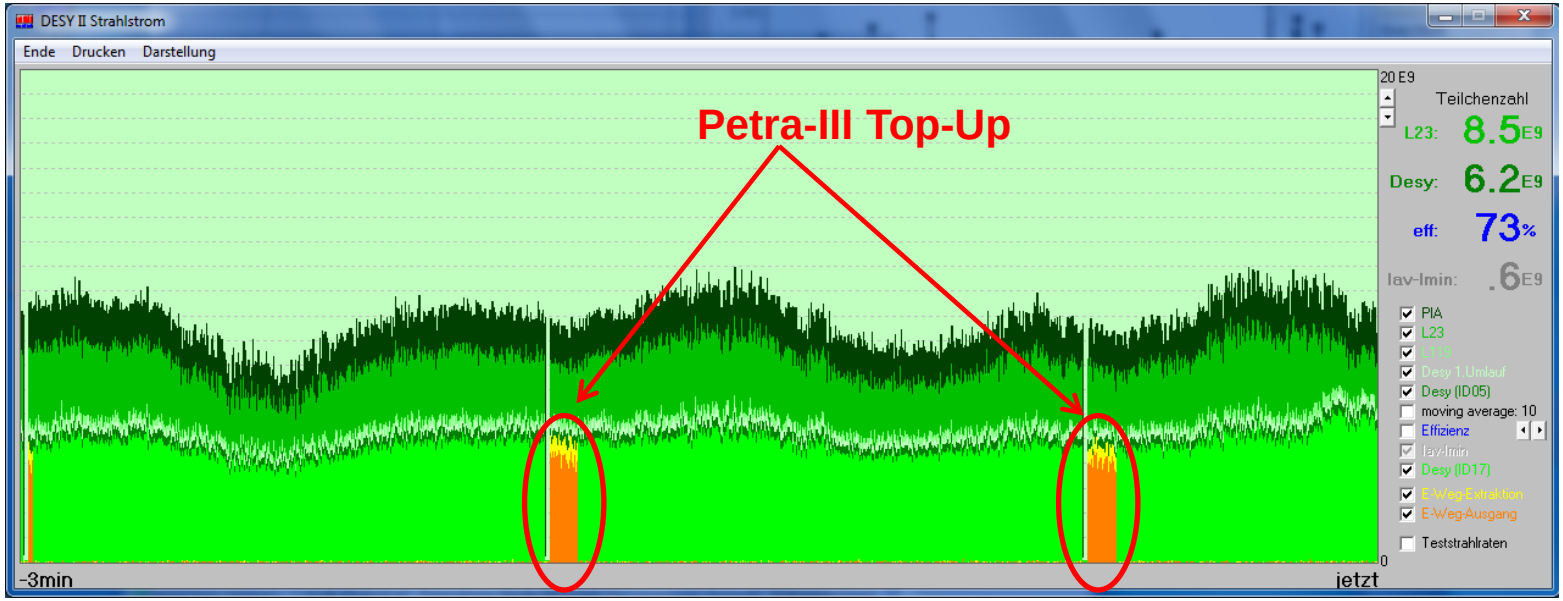
Checking the Door State

BEAM ON - DANGER
Do not enter area

BEAM OFF - AREA Interlocked
INTERLOCK set

BEAM OFF - AREA Open
Free to enter area

DESY-II Operation



> DESY-II

- 6.3 GeV Beam Energy
- Typical Current 6-15 E9 electrons/bunch
- Injector for PETRA-III
- Top-Up every 1 min

> DESY-II Operating Costs

- Estimate (including power, utilities)
- 500 € /hour
- 84000 € /week
- **Please make good use of your beam time !!!**

Thank you for your attention!